Monday, November 7

- Please pass in both of your graphing assignments.....last day to pass both in will be tomorrow
- Today, we will learn 5 new vocabulary terms.....please pay attention!
- Notes/Examples
- Practice Questions

Extra help today and tomorrow at lunch!

5.2 Properties of Functions

LESSON FOCUS Develop the concept of a function.

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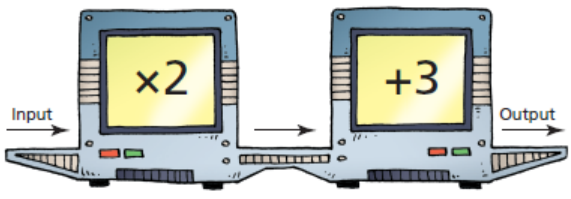
Make Connections



Input	Output
1	5
2	7
	9
4	
	13

What is the rule for the Input/Output machine above?

Which numbers would complete this table for the machine?

THINK ABOUT IT

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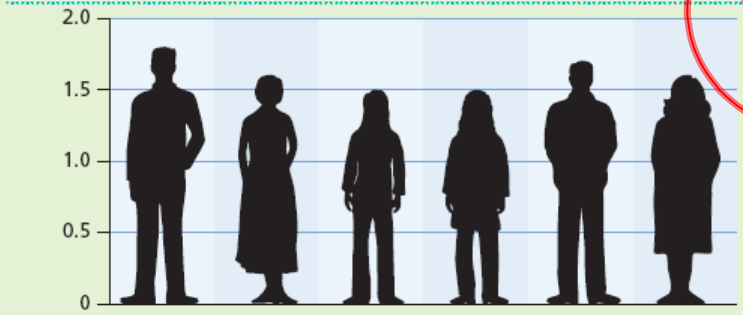


	David	Gina	Sara	Emily	Jack	Helen
Height (m)	1.8	1.6	1.5	1.5	1.7	1.6
Age (years)	40	38	12	10	65	67

Work in a group of 3. Use the picture above.

Each of you chooses one of the relations below.

- *name* related to *age*
- *name* related to *height*
- *height* related to *name*

Represent the relation you chose. Compare the relations.
How are they alike? How are they different?

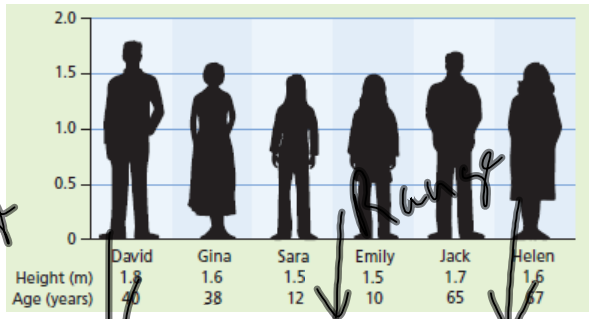
Represent each relation.

1. *name* related to *age*
2. *name* related to *height*
3. *height* related to *name*

Compare the relations.
How are they alike?
How are they different?

Domain

Range



(1) David, Gina, Sara, Emily, Jack, Helen → 10, 12, 38, 40, 65, 67

(2) D, G, S, E, J, H → 1.5, 1.6, 1.7, 1.8

(3) 1.5, 1.6, 1.7, 1.8 → D, G, S, E, J, H

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Relation between
① name and age :

David — 40
Gina — 38
Sara — 12
Emily — 10
Jack — 65
Helen — 67

② name and height

D — 1.5
G — 1.6
S — 1.7
E — 1.8
J
H

③ height and name

1.5 — D
1.6 — G
1.7 — S
1.8 — E
J
H

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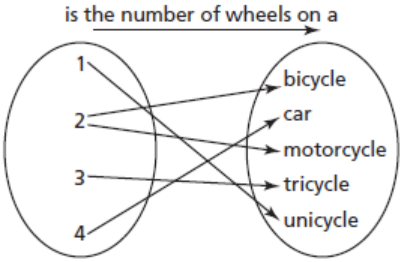
The set of first elements of a relation is called the **domain**.
The set of related second elements of a relation is called the **range**.
A **function** is a special type of relation where each element in the domain is associated with exactly one element in the range.

This relation associates a number with a vehicle with that number of wheels.



?

{(1, unicycle), (2, bicycle), (2, motorcycle), (3, tricycle), (4, car)}
?

The domain is ?
The range is ?

5.2 Properties of Functions

Domain & Range:

Domain - set of all possible x values

Range - set of all possible y values

- When writing domain and range in set notation they should be written in order of smallest to largest. Numbers should not be repeated.

What is the domain for the following ordered pairs? What is the range?

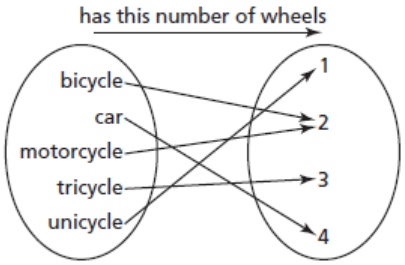
Example 1 (5,6) (8,9) (3,4) (10,11) (2,1) (8,1)

Domain = 2, 3, 5, 8, 10

Range = 1, 4, 6, 9, 11

Function? No → (8,9) (8,1) Same x-value has two y-values

This relation associates a vehicle with the number of wheels it has.



?

{(unicycle, 1), (bicycle, 2), (motorcycle, 2), (tricycle, 3), (car, 4)}

?

The domain is ?
The range is ?

?

5.2 Properties of Functions

Tuesday, November 8

- Please pass in both of your graphing assignments.....Due by the end of the day today!
- Review 5 vocabulary terms learned yesterday.
- Review Examples
- Learn about function notation
- Practice Questions

Extra help today at lunch!

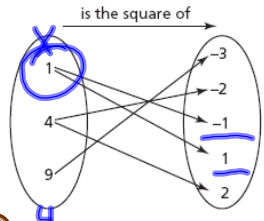
Example 1 Identifying Functions

For each relation below:

- Determine whether the relation is a function. Justify the answer.
- Identify the domain and range of each relation that is a function.

a) A relation that associates given shapes with the number of right angles in the shape: {(right triangle, 1), (acute triangle, 0), (square, 4), (rectangle, 4), (regular hexagon, 0)}

b)



SOLUTION

(x, y)
domain (x-values) 1, 4, 9
range (y-values)
function?

−8, 2, −4, 0, 5

CHECK YOUR UNDERSTANDING

5.2 Properties of Functions

(2, 3) (4, 1) (8, 0)

(3, 9) (4, 0) (5, 6)

domain? 2, 3, 4, 5, 8

range? 0, 1, 3, 6, 9

function? NO

why?

Cause-and-effect relationships

- When a change to one variable causes a change in another variable.

Variables: any measured quantity that changes in an experiment or relationship.

There are three types of variables:

1) **independent variable**: a factor or factors that affect another factor in an experiment or relationship, it is the cause which affects an outcome. Ex: rainfall, vehicle traffic, etc. (x-axis)

2) **dependant variable**: is the factor that is affected by other factors in an experiment or relationship, it is the effect which occurs after particular factors are presented Ex: the amount of tree growth. (y-axis)

3) **controlled variable**: any independent variable whose value is held constant during an experiment.

ind. dep.

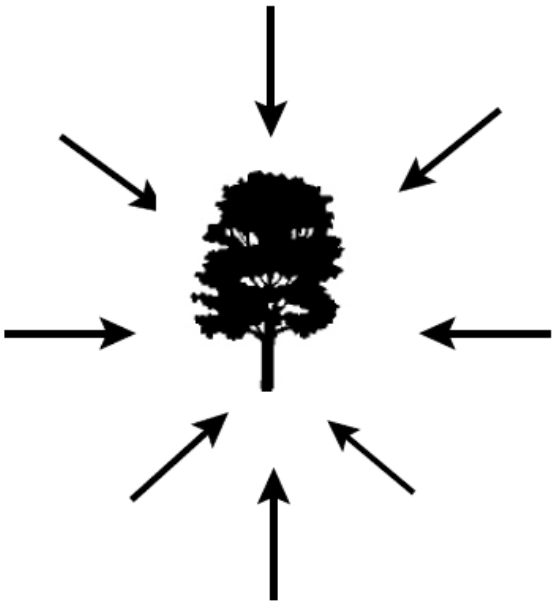
Example: Smoking and Lung Cancer

Example: hours worked and income

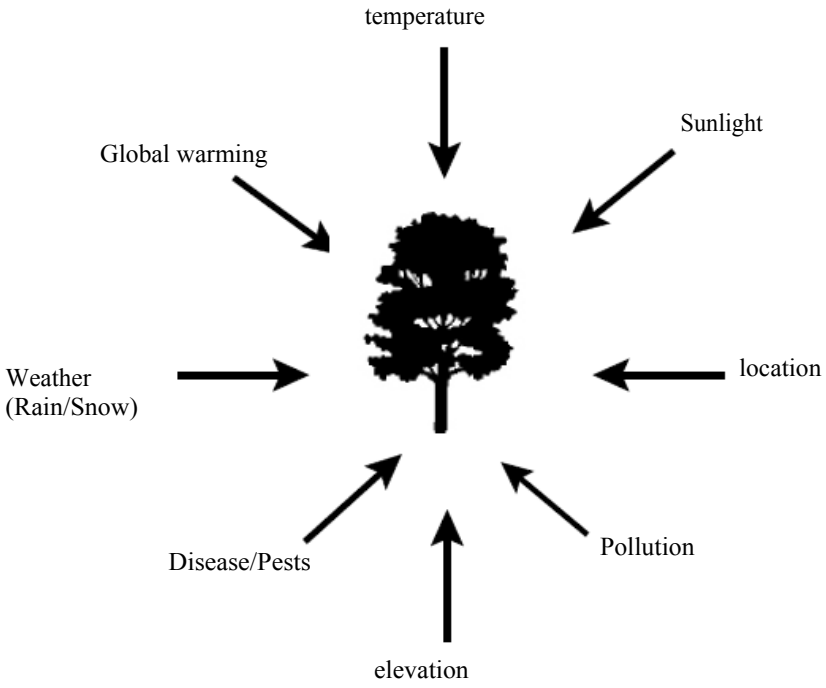
Identify the Dependent variable in each situation:

1. Amount of time spent studying and the test mark received
2. Your mass and your height
3. Brushing your teeth and cavities
4. Lung cancer and smoking
5. Hours worked and money earned
6. Height and shoe size
7. Gas used and distance traveled
8. Milk consumption and strong bones
9. Health of one's hair and hair products
10. Hours of typing practice and typing speed

Factors Affecting Tree Growth



Factors Affecting Tree Growth



In the workplace, a person's gross pay, P dollars, often depends on the number of hours worked, h.
So, we say P is the ? Since the number of hours worked, h, does not depend on the gross pay, P, we say that h is the ?

Hours Worked, h	Gross Pay, P ($)
1	12
2	24
3	36
4	48
5	60

The values of the independent variable are listed in the first column of a table of values. These elements belong to the ?

The values of the dependent variable are listed in the second column of a table of values. These elements belong to the ?

5.2 Properties of Functions

Example 2 Describing Functions

The table shows the masses, m grams, of different numbers of identical marbles, n.

a) Why is this relation also a function?

b) Identify the independent variable and the dependent variable. Justify the choices.

c) Write the domain and range.

SOLUTION

Number of Marbles, n	Mass of Marbles, m (g)
1	1.27
2	2.54
3	3.81
4	5.08
5	6.35
6	7.62

CHECK YOUR UNDERSTANDING

5.2 Properties of Functions

Function Notation

$d(a)$

-notation used to show the independent variable in a function.

For example: f(x) means that the value of the function f depends on the value of the independent variable x.

Example:

$M(q) = 4.4q$

This notation shows that M is the dependent variable and that M depends on q. The equation $M = 4.4q$ describes this function.

$V = -0.08d + 50$

$V(d) = -0.08d + 50$

V = volume
d = distance

$V(600) = -0.08(600) + 50$

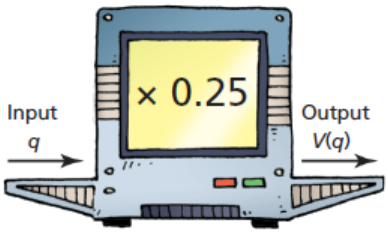
$V(600) = -48 + 50$

$V(600) = 2$

$C = 0.5a - 6$ $\quad C(10) = ?$

We can think of a function as an input/output machine. The input can be any number in the domain, and the output depends on the input number. So, the input is the independent variable and the output is the dependent variable.

- Machine A



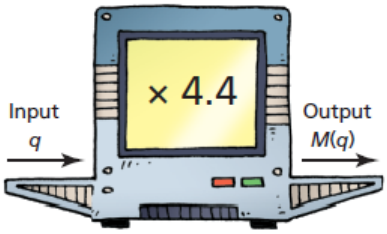
Function V

When the input is q quarters, the output or value, V, in dollars is: ?

?

?

- Machine B



Function M

The mass of 1 quarter is 4.4 g.
When the input is q quarters, the output or mass, M, in grams is: ?
Since M is a function of q, we can write this equation using function notation:
?

Any function that can be written as an equation in two variables can be written in function notation. For example, to write the equation $d = 4t + 5$ in function notation, we may write $d(t) = 4t + 5$. t represents an element of the domain and $d(t)$ represents an element of the range.

When we write an equation that is not related to a context, we use x as the independent variable and y as the dependent variable. Then an equation in two variables such as $y = 3x - 2$ may be written as $f(x) = 3x - 2$.

Conversely, we may write an equation in function notation as an equation in two variables.
For example, for the equation $C(n) = 300 + 25n$, we write ?
And, for the equation $g(x) = -2x + 5$, we write ?

Example 3 Using Function Notation to Determine Values

The equation $V = -0.08d + 50$ represents the volume, V litres, of gas remaining in a vehicle's tank after travelling d kilometres. The gas tank is not refilled until it is empty.

a) Describe the function.
Write the equation in function notation.

b) Determine the value of $V(600)$.
What does this number represent?

c) Determine the value of d when $V(d) = 26$.
What does this number represent?

SOLUTION

CHECK YOUR UNDERSTANDING

Classwork/Homework

- Page 270 #4-10,14,15

Monday, November 14th

- Check and go over homework Pg.270 #4-10, 14, 15
- Begin Section 5.3 (Interpreting graphs)
- Practice Questions

Extra Help Available today at lunch!

(2, 3) (5, 6) (0, 4) (2, 8) (3, 1) (5, 6)

domain? 0, 2, 3, 5 (x-values)

range? 1, 3, 4, 6, 8 (y-values)

function?

$(2,3)(0,1)(5,-6)(7,2)(2,3)$

$(3,-6)$

For every x-value, you can have only <u>one</u> y-value

Ex: $(10,2)(10,-2)(11,3)$

$(2,3)(5,-1)(0,3)(7,2)$ $\quad (7,3)$ $(5,2)$

$d = 3 + 5t$ ← Eqn.

$d(t) = 3 + 5t$ ← function notation

$d(5) = ?$

$d(5) = 3 + 5(5)$

$d(5) = 28$

function ?

$(2,3)\ (4,8)\ (5,2)\ (2,7)$

$I = 500 + 0.50x$

Tuesday, November 15th

- Check and go over homework Pg.270 #4-10, 14, 15
- Begin Section 5.3 (Interpreting graphs)
- Practice Questions

Extra Help Available today at lunch!

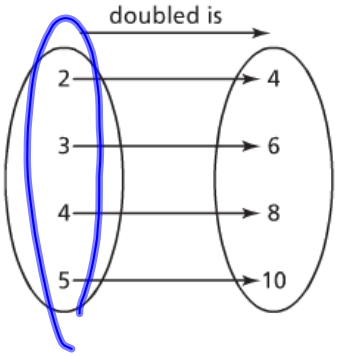
Classwork/Homework

- Page 270 #4-10,14,15

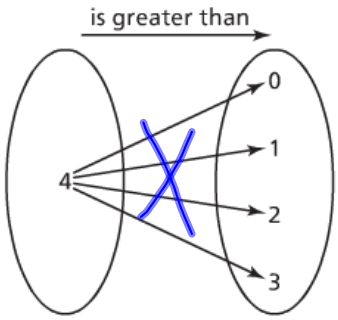
A

4. Which arrow diagrams represent functions?

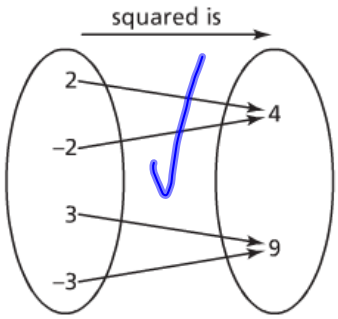
a)



b)



c)



5. Which sets of ordered pairs represent functions? Identify the domain and range of each set of ordered pairs.

a) {(1, 3), (2, 6), (3, 9), (4, 12)}

b) {(1, 0), (0, 1), (−1, 0), (0, −1)}

c) {(2, 3), (4, 5), (6, 7), (8, 9)}

d) {(0, 1), (0, 2), (1, 2), (0, 3), (1, 3), (2, 3)}

D = 1, 2, 3, 4
R = 3, 6, 9, 12

D = -1, 0, 1
R = -1, 0, 1

6. Write in function notation.

a) $C = 20n + 8$ → $C(n) = 20n + 8$

b) $P = n - 3$

c) $t = 5d$

d) $y = -x$ → $y(x) = -x$

7. Write as an equation in two variables.

a) $d(t) = 3t - 5$

b) $f(x) = -6x + 4$ → $f = -6x + 4$

c) $C(n) = 5n$

d) $P(n) = 2n - 7$

8. For each relation below:

- Determine whether the relation is a function. Justify your answer.
- Identify the domain and range of each relation.

a) {(1, 1), (2, 8), (3, 27), (4, 64)}

b) {(3, 4), (3, 5), (3, 6), (3, 7)}

9. For each table of values below:

i) Explain why the relation is a function.

ii) Identify the independent variable and the dependent variable. Justify your choices.

iii) Write the domain and range.

a)

Number of Cans of Juice Purchased, n	Cost, C ($)
1	2.39
2	4.00
3	6.39
4	8.00
5	10.39
6	12.00

b)

Altitude, A (m)	Temperature, T (°C)
610	15.0
1220	11.1
1830	7.1
2440	3.1
3050	−0.8
3660	−4.8

10. This set of ordered pairs associates a number with a polygon that has that number of sides:
{(3, isosceles triangle), (3, equilateral triangle), (3, right triangle), (3, scalene triangle), (4, square), (4, rectangle), (4, rhombus), (4, trapezoid), (4, parallelogram), (5, pentagon), (6, hexagon)}

a) Does the set of ordered pairs represent a function? Explain.

b) Suppose the elements in the ordered pairs were reversed. Use the association "has this number of sides." Would the new relation be a function? Explain.

c) Identify the domain and range of each relation in parts a and b.

14. For the function $f(x) = -5x + 11$, determine:

a) $f(1)$ **b)** $f(-3)$

c) $f(0)$ **d)** $f(1.2)$

$f(x) = -5x + 11$

$f(1) = -5(1) + 11$

$f(1) = 6$

$f(-3) = -5x + 11$

$f(-3) = -5(-3) + 11$

$f(-3) = 26$

15. **a)** For the function $f(n) = 2n - 7$, determine n when:

i) $f(n) = 11$ **ii)** $f(n) = -6$

b) For the function $g(x) = -5x + 1$, determine x when:

i) $g(x) = 41$ **ii)** $g(x) = -16$

$f(n) = 2n - 7$

$11 = 2n - 7$

$+7 \quad +7$

$\frac{18}{2} = \frac{2n}{2}$

$9 = n$

$f(n) = 2n - 7$

$-6 = 2n - 7$

$+7 \quad +7$

$\frac{1}{2} = \frac{2n}{2}$

$n = \frac{1}{2}$

b) For the function $g(x) = -5x + 1$, determine x when:

i) $g(x) = 41$ **ii)** $g(x) = -16$

$41 = -5x + 1$

$-1 \quad -1$

$\frac{40}{-5} = \frac{-5x}{-5}$

$x = -8$

$-16 = -5x + 1$

$-1 \quad -1$

$\frac{-17}{-5} = \frac{-5x}{-5}$

$x = \frac{17}{5}$